Theory of Mind

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Abstract

Humans are a social species. We not only live socially, but also think socially, accumulating myriad thoughts and knowledge about our social world. A hallmark of this human social cognition is an everyday theory of mind—our ordinary human understanding that persons (self and others) have internal mental states—desires, beliefs, feelings, hopes—that crucially shape their actions and lives. I review classic and current knowledge on the nature and importance of theory of mind. Theory of mind is achieved and changes over human development; so, I emphasize that we must understand its development. Fortunately, development of this everyday theory of mind is an intriguing story in its own right, and a great portion of the research on theory of mind is developmental research with typical and atypical infants and children.

In March 2007, NBCNews.com posted an article headlined "Mindreading Scientists Predict Behavior." At a lab in Germany, volunteers in an MRI machine performed simple tasks of deciding whether to add or subtract two numbers that they would see a few seconds later. Researchers tried to read these volunteers' minds from their brain scans, by judging what the person intended, in their thoughts before they acted. The researchers, led by Dr. Haynes in Berlin, were reasonably successful—about 70% accurate at identifying the subjects' decisions about whether they would add versus subtract the two numbers. That made them about 20% more successful than random guessing. The article cited various enthusiastic reactions and even ended by noting that some commentators and ethicists are alarmed by the implications of such mind reading.

Mind reading is indeed amazing. Yet actually, even 2-year olds and 3-year-olds do this sort of thing every day; even infants can succeed at figuring out someone's intentions. They succeed not with fancy machines, but with their fancy 2-year-old brains and their ordinary, still-developing theory of mind. We all "read minds" in this ordinary (mundane but fully amazing) way. And we are better than these scientists—not infallible (but

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often better than 70% for simple things like inferring intentions and then using them to predict behavior) and we are also able to do so in much less constrained everyday situations. How we do this is the story of theory of mind (and a great deal of research).

Theory of mind describes our wide-ranging human understanding of agents' mental states, such as intentions, desires, and thoughts, and how action is shaped by such states. It refers to our everyday psychology, appropriately emphasizing the "mind reading" that so strongly characterizes our everyday, commonsense understandings. Consider Romeo and Juliet. We easily understand that Romeo loves Juliet and *wants* to be with her. But he *thinks* his parents (and his clansmen) will violently object, so he tries to meet with her in secret.

Philosophers and psychologists often characterize our everyday theory of mind as a belief–desire psychology. Such an everyday psychology provides explanations and predictions of action by appeal to what the person thinks, knows, and expects, coupled with what he or she wants, intends, and hopes for. Why did Romeo meet Juliet secretively: He *wanted* to be with her, and *thought* his kinsmen would interfere. Everyday psychological reasoning also includes reasoning about the origins of mental states (Romeo wants to be with Juliet because he *loves* her; he thinks his kinsmen will violently object because he has *seen* their violence in the past). That is, beyond beliefs and desires, theory of mind incorporates a variety of related constructs such as drives and preferences that ground one's desires, and perceptual–historical experiences that ground one's beliefs. It also includes emotional reactions that result from these desires, beliefs, preferences, and perceptions: happiness at fulfilled desires, frustration at unfulfilled desires, surprise when events contradict one's firmly held beliefs.

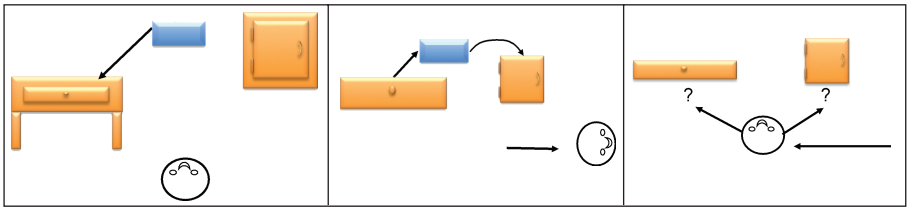
Acquisition of this everyday theory of mind may be one of the most impressive intellectual accomplishments of human development. Much like human language, theory of mind is notably abstract, but accomplished in basic forms rapidly by young children everywhere. And, again like language, both intriguing early competences and striking developments are readily apparent: Infants closely attend to other humans; 2-year-olds talk about persons' wants and feelings and comfort others in distress; 3-year-olds and 4-year-olds talk about thoughts and begin to engage in lies and trickery; and nuanced theories of mind—in adults' "folk psychologies"—are apparent in (and dramatically differ across) cultural communities worldwide. Indeed, revealing developmental data showing near-universal attribution by young children of mental states to self and others has helped fuel rampant contemporary interest in theory of mind. Lay adults and children are embedded in theory of mind; scientists, scholars, and the newsreading public are now immersed in it.

FOUNDATIONAL RESEARCH

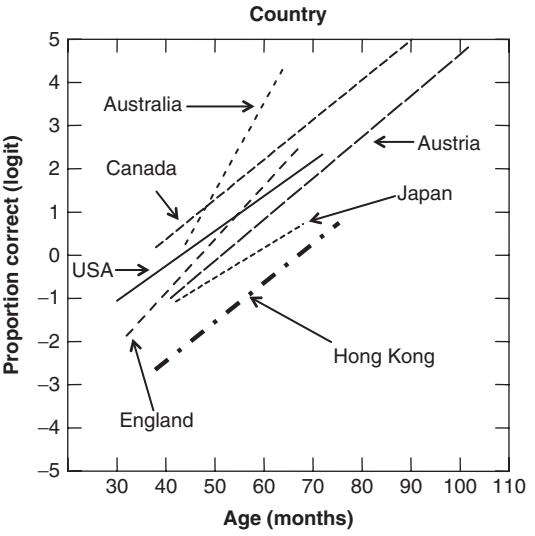
Think about Romeo and Juliet again. Theirs is a story about love and desire, but love and desire gone awry. At the end of the play, down in the crypt, Romeo still desires Juliet who is alive and well right beside him, but he kills himself. Why? Because, *he believes she is dead*. Understanding the possibility of an internal realm of mental representations (ideas, thoughts, images) is a hallmark of theory of mind. Understanding false beliefs (FBs), when contents of the world (Juliet is alive) contradict the contents of thought ("Juliet is dead"), provides a powerful illustration of such everyday understanding.

This is one reason why there has been so much research on children's understanding of FBs (hundreds of studies and thousands of children encompassed in several meta-analyses, e.g., Milligan & colleagues, 2007; Wellman & colleagues, 2001). Another reason for this voluminous research is that when researchers were first becoming interested in theory of mind, several easy-to-use, "standard" false-belief tasks were developed of the sort depicted in Box 1. And these have proved nicely revealing. For one, they consistently show an important developmental transition. Indeed, as graphed in Box 1, because they have been used worldwide, false-belief tasks reveal a universal childhood theory-of-mind developmental achievement. Worldwide, children go from consistent false-belief errors to consistently correct understanding of FBs during early childhood. The timing of coming to understand FBs can also differ intriguingly across countries.

Box 1



FB tasks have children (or adults) reason about an agent whose actions should be controlled by an FB. Such tasks have many forms, but a common task employs a change in locations, as depicted above. The child (not shown above) sees the character, Jill, puts her candy in the drawer. Jill leaves and, while she cannot see, the candy gets moved to the cupboard. Jill returns, wants her candy, and the child is asked "Where will Jill look for her candy?" or "Where does Jill think her candy is?" Older children answer correctly, like adults. Younger children answer incorrectly; they are not just random they consistently say Jill will search in the cupboard (where it really is). Note that the task taps more than just attribution of ignorance (Jill doesn't know) rather attribution of FB (Jill thinks—falsely—her candy is in the drawer).



(Data from Wellman and colleagues 2001; Liu and colleagues 2008.)

A frequently used alternative task uses deceptive contents (rather than change of location). For example, children see a crayon box, say they think it holds crayons, then upon opening see it holds candies. They are asked what someone else who has never looked inside will think the box holds—crayons or candies.

Several factors make such tasks harder or easier, but nonetheless children go from consistently below -chance to above-chance performance, typically in the preschool years. Moreover, as shown in the graph at left, children in different cultural-linguistic communities can achieve FB understanding somewhat more quickly or more slowly, yet in all locales they evidence the same trajectory—from below-chance to above-chance performance in early to middle childhood. This is true even for children growing up in non-western cultural communities speaking non-Indo-European languages. And is true even for children in traditional, nonliterate societies.

There is more to say about FBs, but a focus on a single task or achievement is limited and misleading. So, importantly, other research shows that by 4–6 years, children not only expect people to act in accord with their beliefs but also explain persons' actions by citing their mental states, including their beliefs; they also come to understand about lies and deception, appearances versus reality, that someone's external expressions need not display their internal emotions, and more. As a single intriguing example, 3-year-old and 4-year-old children explicitly judge that a person's ideas, thoughts, and dreams are "internal," immaterial, private experiences in contrast to real, concrete, overt physical events (Harris & colleagues, 2006; Wellman & Estes, 1986).

Social Action

Children's development of this network of belief–desire reasoning dramatically impacts their actions and interactions with others. One way to appreciate this is to note that amid the consistent trajectories shown in Box 1, there is also obvious variation. Although almost all normally developing children eventually master FBs, some children (not only across countries, but also within any cultural–language community) come to this understanding somewhat earlier and some later. This variation has been important for identifying outcomes that are influenced by theory-of-mind understandings. Indeed, differences in FB understanding, as measured in the preschool years, predict several key childhood competences, such as how and how much children talk about people in everyday conversation, their engagement in pretense, their social interactional skills, and consequently their interactions and popularity with peers. Preschool variation in theory-of-mind understanding also influences children's use of deception, their strategies for arguing with and persuading others, and their actions in games like Hide-and-Seek. These findings reveal and confirm theory of mind's real-life relevance. (See Wellman, 2014, Chapter 3, for a review.)

Autism

What would social understanding and social interaction be like for someone with an impaired theory of mind? A long-standing proposal is that individuals with autism might approximate such a case—the "theory-of-mind hypothesis for autism." Indeed, in classic studies, school-age children and adolescents with autism were given standard false-belief tasks much like the one depicted in Box 1. Although the tasks were largely nonverbal (and children could respond merely by pointing), and although individuals with autism were correct on all the related control questions, they were consistently incorrect on the false-belief judgments themselves. In comparison, not only are younger typically developing 4-, 5-, and 6-year-olds consistently correct, older children with Down's Syndrome, matched in age to those with autism, are also consistently correct (Baron-Cohen, 1995).

The consensus perspective on theory of mind is that it targets a special sort of reasoning about the social domain of agents' actions and minds. But, perhaps, theory of mind is really just a straightforward manifestation of more domain-general cognitive processes such as memory, inference, and executive functioning. And, similarly, perhaps those are the critical deficits for autism, not something more specially social–cognitive. In this regard, high-functioning autistics' performance with false photographs versus FBs has proved revealing. False-belief tasks are outlined in Box 1; false-photograph tasks are comparable in format, but target not mental

representations that are outdated and so false but rather outdated photos that no longer match what is so. High-functioning autistics that consistently fail false-belief tasks consistently pass parallel false-photo tasks (Leekam & Perner, 1991; Leslie & Thaiss, 1992). Because these individuals' memory, attention, learning, and executive functioning are sufficient to understand false photos, such domain-general processing factors fail to account for their parallel difficulties with FBs. Data such as these help confirm that theory of mind is a specialized and distinctive form of social understanding.

At the same time, it is important to note that almost no researchers or clinicians today argue that autism deficits are solely characterized or caused by theory-of-mind deficits.

Infancy

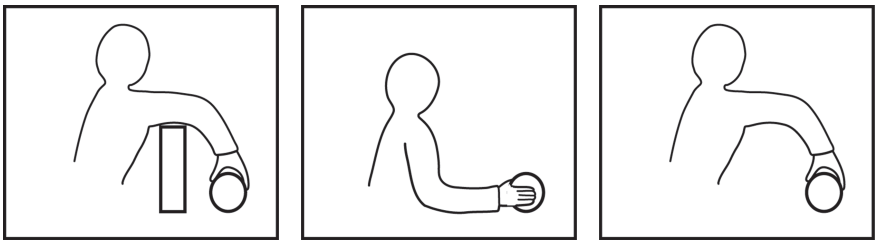
Classically, theory-of-mind research began with older children, such as preschoolers, and moved backward. It is now clear that understanding of people in terms of their internal, psychological states begins in infancy.

The earliest examples of psychological construals of persons appear in intention understandings; by the end of the first year, children begin to treat themselves and others as intentional agents. Box 2 presents an example of just one method used to demonstrate intention understanding in infants (from Brandone & Wellman, 2009). In the initial demonstrations, using something like this paradigm, infants saw an animated circle "jumping" over a barrier to reach its goal object. Just as they do for intentional human acts like reaching, 9- and 12-month-olds look longer at the animated indirect test events over the direct ones, showing an abstract, generalized understanding of intentional agency (Gergley & colleagues, 1995).

Infant understandings of intentional action appear not only in looking-time research but also in more active–interactive paradigms. A classic study of this type went beyond examining infant understanding of successful actions (e.g., a reach that successfully retrieves an object, as in Box 2) to consider understanding of failed actions (Meltzoff, 1995). Arguably, inferring a goal when it is unfulfilled, and thus nonovert in the actor's movements or outcomes, demonstrates a still deeper understanding that intentions exist beneath the surface of performed actions. So, in this study, 18-month-olds witnessed an adult try *but fail* to fulfill several novel, object-directed goals (e.g., trying to hang a ring on a hook). Although infants never saw the actions successfully modeled, when given a chance to act on the objects themselves, they "imitated" the successful action much more than the failed (actually

witnessed) actions. So, they understood the action's goal even when it was never observed.

Box 2



Habituation-test (or familiarization-test) looking-time paradigms set the infant up so that he or she will then look longer at novel, unexpected test events. In the reaching paradigm (above), infants view multiple trials of the barrier-reaching event in habituation. Then, the barrier is *removed* and the test events contrast two different construals of the person's actions, one in terms of intentions and one in terms of physical motions of the body. Suppose during habituation the infant construes the actor's action in terms of its physical movement (the arm and hand up and then down in an arc), then the indirect reach test event should be expected (as it repeats the same movement), whereas the direct reach will stand out as novel and so specially attention-worthy. In contrast, if the infant initially construes the action as goal directed, then when the barrier is removed the direct reach is the expected action because there the actor continues to directly seek the goal. Under this second construal, the indirect reach would be more attention-worthy because (although the actor's arm movement remains the same as during habituation) the actor no longer seems straightforwardly directed to the goal. Infants who are 8, 9, 10, and 12 months old consistently look longer at the *indirect* test event. Infants look equally to both test events in control conditions where they are first habituated to a display with no barrier *or* first habituated to the exact same over-the-barrier arm movements but where there is no goal-object.

Key infant understandings encompass their understanding of intentional action *and* internal experience. Consider infant gaze following. When watching an adult shift his gaze to look at some salient toy, infants by 9 months of age shift their gaze to follow the adult's gaze to that toy. Potentially, infant gaze following might be produced by an understanding that the agent sees something—the adult has a visual experience of some sort and that is what I will see if I look over there. However, infants may instead just automatically and unknowingly match the adult's behavior, without any deeper understanding. In fact, young infants often "gaze follow" adults wearing blindfolds. Yet, in telling research, 12-month-olds were given advance experience with blindfolds occluding their own vision (Meltzoff & Brooks, 2008). After such experiences, they were significantly less likely to "gaze follow" a blindfolded adult, suggesting that their sense of what the adult

can see—visually experience—guided the infants' actions. By 18 months, infants do not often gaze follow a blindfolded adult—probably because they have come to understand that blindfolds occlude visual experience. But, in this same study, 18-month-olds were given an experience with a special blindfold that looked opaque yet was easily seen through when worn. After the experience with *that* blindfold, 18-month-olds did gaze follow the head-turn of a blindfolded adult. Thus, by 12–18 months, infants develop a sense of the person's visual experience, and it is this awareness of visual experiences (not just overt eye- or head-directedness) that controls their gaze following.

CUTTING-EDGE RESEARCH

The Progressive Course of Theory-of-Mind Development

Theory-of-mind understandings begin in infancy, but also progress; earliest understandings of intentional action give way to a later, richer belief–desire system of understanding (see Wellman, 2011 for a chapter-length overview of theory-of-mind development; see Wellman, 2014, for a book-length treatment). Within such a crude progression are several more precise ones. The best-established progression concerns comparisons between preschool children's understanding of desires and intentions versus beliefs. When tested in closely comparable tasks, toddlers evidence an understanding that people can have differing desires for the exact same object or event, but not that they may have differing beliefs.

Beyond this shift, more detailed, extended progressions of understanding characterize theory of mind. A clear example comes from an established Theory-of-Mind Scale (Wellman & Liu, 2004) that encompasses carefully constructed tasks assessing childhood understanding of (i) Diverse Desires (people can have different desires for the same thing, DD), (ii) Diverse Beliefs (people can have different beliefs about the same situation, DB), (iii) Knowledge Access (something can be true, but the uninformed are ignorant of that, KA), (iv) FBs (something can be true, but someone might believe something different), and (v) Hidden Emotions (someone can feel one way but display a different emotion, HE). Studies using this carefully scaled battery of tasks, encompassing more than 500 preschoolers in the United States, Canada, Australia, and Germany, evidence a clear and consistent order of difficulty. It is of the order listed above, with DDs the easiest, understanding knowledge and beliefs harder, and HEs the hardest. For shorthand, call this sequence, DD>DB>KA>FB>HE. This sequence is highly replicable and significant—80% of these children show the pattern DD>DB>KA>FB>HE.

Universality

The data for FBs in Box 1 begin to show an intriguing universality in early theory-of-mind understanding. Young children worldwide evidence a belief–desire understanding of persons, as indexed by their emerging false-belief understanding. Current data go beyond such classic findings to demonstrate universality coupled with intriguing cultural influences on theory of mind. Research using the Theory-of-Mind Scale clarifies this.

Assume that theory-of-mind understandings are the products of social and conversational experiences that vary from one community to another. Western and Chinese childhood experiences could be crucially different. Various authors have described an Asian focus on persons as sharing group commonalities and interdependence and a contrasting Western focus on persons as distinctively individual and independent. These differences include differing emphases on common knowledge and perspectives versus emphases on diversity of individual beliefs and perspectives. Moreover, Western and Chinese adults seem to manifest very different everyday epistemologies—everyday notions of knowledge, belief, truth, and learning. Everyday Western epistemology is focused on truth, subjectivity, and belief; Confucian–Chinese epistemology focuses more on pragmatic knowledge acquisition and the consensual knowledge that all right-minded persons should learn. Indeed, in conversation with young children, Chinese parents comment predominantly on "knowing," while US parents comment more on "thinking."

In accord with such conversational–cultural preferences for emphasizing knowledge acquisition versus belief differences, Chinese preschoolers evidence a consistent, but different, theory-of-mind sequence where KA (knowledge access) and DB (diverse beliefs) are reversed: DD>**KA**>**DB**>FB>HE rather than DD>**DB**>**KA**>FB>HE (Wellman & colleagues, 2006). Both Western and Chinese children first understand the basic aspects of desire (DD), but after that Western children first appreciate belief differences (DB), while Chinese children first appreciate knowledge acquisition and access. While the two sequences are notably similar (pointing to robust, universal processes of theory-of-mind development), they are also crucially different (pointing to experience-dependent processes of theory-of-mind learning as well).

An alternative, experience-dependent sequencing is not some singular peculiarity of Chinese mind and development; the same alternative sequence appears in Iranian preschool children. Despite profound differences in Iran's Muslim traditions and beliefs in contrast to the Chinese Confucian/Buddist/Communist ones, both China and Iran share collectivist family values emphasizing consensual learnings, knowledge acquisition, and low tolerance for childhood assertions of disagreement and independent

belief. In parallel, children in Iran display the DD>KA>DB>FB>HE sequence displayed by Chinese children (Shahaeian & colleagues, 2011).

Deafness

Not only can sequences of theory-of-mind understandings differ (e.g., for Chinese vs US children), but as Box 1 shows, timetables can differ as well. Beyond the modest timing differences depicted in Box 1, theory-of-mind understandings can be seriously delayed. Indeed, as noted before, false-belief understanding is seriously (not modestly) delayed in children with autism. Most adolescents and adults with autism perform poorly on false-belief tasks. But, then, autism is replete with neurological impairments, general across-the-board cognitive delays. Autism could certainly have its own delayed maturational timetable. Intriguingly, deaf children often evidence serious theory-of-mind delays as well. Deaf children do not suffer from the same central neurological impairments and retardation as individuals with autism; they have peripheral hearing loss instead. Their data further emphasize the crucial role of social–conversational experiences in children's acquisition and construction of their theories of mind.

Neatly enough, there are two main groups of deaf children to consider. Deaf children of deaf parents grow up with ordinary conversational, language experiences—albeit in sign language—and so grow up with others who communicate and interact with them profusely. But, most deaf children—about 95%—are born to hearing parents. They grow up with very different early experiences. For example, despite valiant efforts to learn sign, hearing parents rarely achieve real proficiency. Especially, when their child is young, hearing parents mostly communicate with their deaf child using simple signs or gestures to refer to here and now objects. Also, usually only one person in the family—often the mother—is the "designated" primary communicator and interactor for the child. The deaf child in a hearing family begins life with little discourse about persons' inner states, thoughts, and ideas, is likely to have restricted play with others, and generally has less access to the free-flowing, turn-taking, perspective-negotiating dance of social communication and interaction.

Initial research in the 1990s showed that deaf children of hearing parents (but *not* deaf children of deaf parents) were substantially delayed in understanding FBs, typically as delayed as high-functioning children with autism (Peterson & Siegal, 1995). More informatively, when deaf children (of hearing parents) receive the Theory-of-Mind Scale, like hearing children, they too evidence a consistent sequence of progression, but one that is delayed at every step of the way (Peterson & colleagues, 2005). It takes deaf children 12 or more years to progressively achieve what hearing children (and deaf children of deaf parents) progressively achieve in 4–6 years.

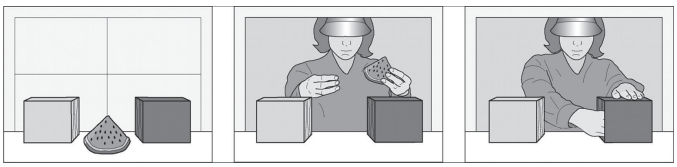
The data for deaf children of hearing parents also speak strongly against any maturational, critical-period analysis of theory of mind. Deaf children of hearing parents continue to progress on what are typically "preschool" theory-of-mind understandings as adolescents and adults.

Infancy

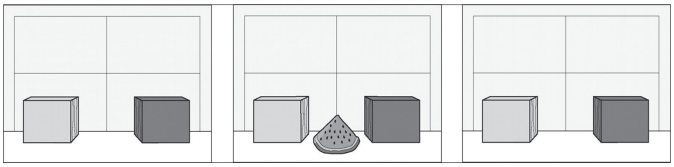
Recent research claims infants go beyond an understanding of intentional actions and internal experiences. By 10–15 months, they already recognize that actors act on the basis of their beliefs and FBs. Box 3 presents the essence of the initial influential task and findings. Several other demonstrations are also on offer. These emerging infant "false-belief" studies are clever and revealing. It remains unclear and controversial, however, how these findings should best be interpreted. Whether or not these studies reveal a true infant understanding of FBs, however, I believe they confirm, at a minimum, that infants understand actors as goal-directed, that infants track the changing experiences of other persons that yield for them awareness or unawareness of key events (at least in simplified scenarios), and that infants expect aware and unaware agents to act differently.

Box 3

A. Familiarization: Agent puts toy in dark box

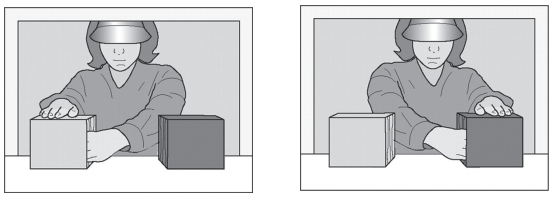


B. Change: Agent doesn't see toy move to lighter box



C. Test events: Infant sees agent search, in either

new location prior location



Recent research claims that the intention understanding of 1-year-old infants also includes FB understanding. The initial and most well-known demonstration comes from Kristine Onishi and Renee Baillargeon (2005), in a familiarization-test paradigm schematized here. In essence, paralleling standard tasks (Box 1), infants see that the agent places the object in one location and does not see the object switch locations. If infants expect the agent to search in the prior location (on the basis of a FB), they should look longer at the new-location test event. 15-month-old infants do consistently look longer at new location-test events.

Note, however, that understanding FB requires more than just understanding ignorance. So, alternative interpretations are possible based on an infant understanding of ignorance rather than FB. For example, if infants understand the agent is unaware (and thus ignorant of the location of the object), that understanding would be sufficient for them to see the new-location test event as novel or unexpected (e.g., if the agent is ignorant, she might search in neither place, she might search in both places, she might search incorrectly, but in any event it would be novel/unexpected to see her search directly in only the correct location.)

KEY ISSUES FOR FUTURE RESEARCH

It is easy to think of key issues for research going forward. Research is needed on how theory of mind influences social learning, for example, how it impacts children's receptiveness to and learning from others ("testimony"); (Harris, 2012). Research is needed on the interplay between children's theory of mind and their emerging moral judgments. Research is needed on theory of mind beyond childhood development—how does it operate in adults or in the elderly? For example, is theory of mind party to the general declines of cognitive aging or is it specially preserved and resistant to decline?

Three additional future directions for research stand out in my mind.

INFANCY

The emerging data on infants' understanding of minds, including demonstrations of their understanding of belief-like states (as in Onishi & Baillargeon, 2005), are intriguing and transformative. Clearly, infants are deeply attuned to agents' actions and states. The emerging data on infant "FBs" are, however, still patchy and unsystematic. They are also interpreted in widely discrepant ways by various competing researchers. Moreover, it is far from clear how to reconcile the infant research with that from preschoolers. Whatever is the best account of infant theory-of-mind development, preschool developments and achievements remain important. It is the preschool achievements, recall, that relate to children's social actions—their popularity with peers, their engagement in social pretense, and their prosocial and antisocial interactions. The current inconsistencies

and competing interpretations demand future research with infants and research reconciling infant and preschool understandings.

Developmental Neuroscience

Theory of mind is not only a conceptual achievement characterized by developmental and conceptual-learning processes. It is a cognitive system characterized by distinctive neural bases and processes as well.

Cognitive neuroscientific investigations with adults demonstrate that theory-of-mind reasoning involves a network of neural regions: the medial prefrontal cortex (medial PFC) and the left and right temporoparietal junction (TPJ) most consistently, as well as the superior temporal gyrus/superior temporal sulcus (STG/STS), and the temporal poles (Gallagher & Frith, 2003; Saxe & colleagues, 2004). These regions are recruited when adults engage in multiple mental-reasoning tasks across functional neuroimaging (fMRI) and electrophysiological (EEG/ERP) methods alike.

To illustrate, adults show increased BOLD signal (the hemodynamic response that indexes neural activation and is tracked by fMRI) in bilateral TPJ, anterior STS, medial PFC when reading stories requiring mental-state inferences (i.e., inferring thoughts and knowledge states from a series of human actions and interactions) in contrast to reading nonmental *human* descriptions (e.g., nonmental social interactions and descriptions of people's appearances).

Even if the adult findings were crystal clear, however, understanding neurocognitive processes in cognitively expert adults does not translate to an understanding of brain and cognition earlier in development. Yet, theory of mind undergoes rapid and stark advancements over infancy and early childhood. Thus, direct neurocognitive examinations of younger children—especially in the age range from 2 to 6 or 7 years, when developmental changes are so pronounced—are needed to more clearly address important and outstanding questions on theory of mind and its development (for initial research, see Liu & colleagues, 2009; Sabbagh & colleagues, 2009).

As one more concrete example, again consider infant theory-of-mind understandings. Infant social–cognitive understandings are measured most consistently with nonverbal, implicit, looking-time methods (Boxes 2 and 3), and disputes rest highly on questions of how these implicit measures relate to the explicit, verbal measures used with older children and adults (Box 1). Potentially, neuroscientific investigations should help us distinguish implicit versus explicit types of reasoning. Studies that examine neural correlates as infants perform implicit theory-of-mind tasks could identify neural similarities and differences between them and older children performing explicit, standard theory-of-mind tasks.

Theory of Mind and Naïve Sociology

Theory of mind is often called naïve psychology—our everyday, common understanding of agents via their psychological, mental states. In this way, it is distinguishable from several other everyday theories, classically naïve physics and naïve biology. Using this terminology, humans may well achieve a naïve sociology (Banaji & Gelman, 2013)—an everyday understanding of social groups (allies and enemies), of social rules (obligations and privileges), and social categories (gender and race). A key question to consider is to what extent are naïve sociology and naïve psychology distinct and to what extent do they overlap? Some theorists attempt to decisively segregate two very different sorts of social cognition—naïve psychology versus naïve sociology. But, a long-standing and key claim about theory of mind is that it is central to all our social cognition—and is foundational to the way we humans make sense of our social world, our social interactions, and our social organizations. I believe that theory of mind cannot be neatly or decisively segregated from these additional societal understandings. On this perspective, naïve psychology and naïve sociology largely overlap. Not every social cognition has a psychological face, of course, but still I would argue that vast portions of the social world—including our understanding of morality and social rules, social identities and social categories, social groups and interactions—are grounded in our everyday construal of social actors as psychological, belief–desire agents. Future research is still needed to establish the nature and development of social cognition in all its breadth and interconnections.

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Henry Wellman was born in Hickory, North Carolina, received his undergraduate degree from Pomona College, was a kindergarten and preschool teacher for several years, then received his PhD from the Institute of Child Psychology at the University of Minnesota. Wellman has been at the University of Michigan for more than 30 years where he is the Harold. W. Stevenson Collegiate Professor of Psychology. For many years, his research has focused on children's developing knowledge of persons. He has written more than 100 articles and several books including *The Child's Theory of Mind* (1990), (with Karen Bartsch) *Children Talk about the Mind* (1995), and *Making Minds* (2014). He is a former president of the Cognitive Development Society, recipient of an NIH MERIT Award, recipient of the University of Michigan's Distinguished Faculty Achievement Award and of the American Psychological Association's G. Stanley Hall Award for distinguished research contributions to Developmental Psychology. He lives in Ann Arbor, Michigan, with his wife Karen Lind, and has two sons Ned and Daniel.

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